IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Jin Baek KIM, et al.

Application No.: 10/748,230 Group Art Unit: 3745

Filed: December 31, 2003 Examiner: Christopher M. VERDIER

For: TURBOFAN AND MOLD MANUFACTURING THE SAME

SUBMISSION OF ENGLISH TRANSLATION OF CERTIFIED COPY OF PRIOR FOREIGN APPLICATION IN ACCORDANCE WITH THE REQUIREMENTS OF 37 C.F.R. § 1.55

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 1.55, the applicants submit herewith a an English translation of a certified copy of the following foreign application:

Korean Patent Application No. 2003-35569
Filed: June 3, 2003

It is respectfully requested that the applicants be given the benefit of the foreign filing date as evidenced by the English translation of the certified papers attached hereto, in accordance with the requirements of 35 U.S.C. § 119 and 37 C.F.R. § 1.55.

Respectfully submitted,

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DECLARATION

I, Bong Seok SEO, a Patent Attorney in Korea of 9th Fl., Seolim Bldg., 649-10, Youksam-Dong, Gangnam-Gu, Seoul, Korea, hereby declare that I am the translator of the Korean Patent Application No. P2003-35569 that the followings are true translation to the best of my knowledge and belief

SIGNATURE

Bong Seok SEO

Dated February 7, 2006

English Translation of Korean Patent Application No. 2003-35569

[ABSTRACT]

[ABSTRACT]

A mold capable of molding an integral turbofan by only one molding process and the turbofan produced by the mold. The mold includes a rotating plate joined to a shaft of a drive motor, an outer ring concentrically disposed outside the rotating plate with a spacing therebetween, a plurality of blades radially arranged on a peripheral portion of a front face of the rotating plate and integrally connected at the rear ends thereof to the rotating plate and the outer ring, and a ring-shaped shroud integrally formed with the front ends of the blades. The mold includes a first mold half having a first front molding part to form a front face of the rotating plate, a second front molding part disposed outside the first front molding part to form the front face of the shroud, and a third front molding part disposed outside the second front molding part with to form a front face of the outer ring, and a second mold half adapted to be combined with the first mold half, and including a first rear molding part disposed at the center of the second mold half to form a rear face of the rotating plate, a plurality of rear molding parts disposed outside the first rear molding part and having shapes corresponding to spaces between the blades to form a rear face of the shroud and the plurality of blades, and a third rear molding part disposed outside the second rear molding parts to form a rear face of the outer ring.

[REPRESENTATIVE DRAWING]

Fig. 5

[SPECIFICATION]

[TITLE OF THE INVENTION]

TURBOFAN AND MOLD FOR MANUFACTURING THE SAME

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 is a perspective view of a conventional turbofan;

FIG. 2 is an exploded perspective view of the turbofan of FIG. 1;

FIG. 3 is a front perspective view of an integral turbofan according to the present invention;

FIG. 4 is a rear perspective view of the integral turbofan shown in FIG. 3;

FIG. 5 is a cross-sectional view of a mold for manufacturing the turbofan shown in FIG. 3, according to the present invention, in which the mold is disassembled;

FIG. 6 is a cross-sectional view of the mold shown in FIG. 5, in which the mold is assembled; and

FIG. 7 is a cross-sectional view taken along line VII-VII of FIG. 6.

* Description of reference characters of main parts *

10: turbofan, 11: circular rotating plate,

12: outer ring, 13: blade,

14: shroud, 15: annular spacing,

20: first mold hal, 21: first front molding part,

22: second front molding part,

23: third front molding part,

24, 25: molding groove,

30: second mold half,

31: first rear molding part,

32: second rear molding part,

33: third rear molding part.

[DETAILED DESCRIPTION OF THE INVENTION]

[OBJECT OF THE INVENTION]

[FIELD OF THE INVENTION AND PRIOR ART]

The present invention relates to a turbofan and a mold for manufacturing the same, and more particularly, to a turbofan and a mold for manufacturing the same, which enables the turbofan to be integrally molded by a single molding process.

Generally, a turbofan is a kind of centrifugal fan, which is adapted to blow air generated from the rotating blades. As shown in FIG. 1, the turbofan comprises a circular rotating plate 1 having a central hub 1a to which a rotating shaft of a drive motor (not shown) is coupled, a plurality of blades 2 which are radially disposed at a periphery of the circular rotating plate 1 with regular intervals therebetween such that the blades 2 are positioned to be perpendicular to the rotating plate 1, and a ring-shaped shroud 3 coupled to free ends of the blades 2 to support the blades 2.

The turbofan is usually produced by a plastic injection molding process. Since the configuration of the turbofan is complicated, the turbofan is provided with a number of undercuts at blades 2 thereof, thereby causing a separation of a mold therefrom to be difficult. Therefore, the turbofan is hard to integrally mold by only one molding process. To overcome this disadvantage, a conventional turbofan is produced in such a way that a part A, in which a rotating plate 1 and blades 2 are integrally molded, and the shroud part 3 are first molded by separate molds, as shown in FIG. 2, and the part A and the shroud part 3 are combined with each other by ultrasonic fusion or heat fusion in a subsequent procedure.

However, since the conventional turbofans are produced by a process of molding a plurality of components in separate molds and joining the components together, the

productivity of the conventional turbofans is decreased due to the complicated manufacturing process. Furthermore, since the conventional process of manufacturing turbofans requires a plurality of molds for the components, the manufacturing costs are drastically increased due to production of the molds. In addition, since a plurality of components are joined to one another afterward, defective fraction of the products is increased by poor assembly.

[OBJECT OF THE INVENTION]

Accordingly, it is an aspect of the present invention to provide a turbofan and a mold for manufacturing the same, which enables the turbofan to be integrally produced by only one molding process so as to improve productivity, and to reduce manufacturing costs.

[CONSTRUCTION AND OPERATION OF THE INVENTION]

The above aspect is achieved by providing a turbofan including a rotating plate joined to a shaft of a drive motor, an outer ring concentrically disposed outside the rotating plate with a spacing therebetween, a plurality of blades radially arranged on peripheral portion of a front face of the rotating plate and integrally connected at rear ends thereof to the rotating plate and the outer ring, and a ring-shaped shroud integrally formed with front ends of the blades.

An external diameter of the rotating plate may be equal to or smaller than an internal diameter of the shroud, and an internal diameter of the outer ring may be equal to or larger than an external diameter of the shroud.

The blades may be integrally formed with the rotating plate and the outer ring at both ends of rear sides thereof.

The above and/or other aspects are achieved by providing a mold for manufacturing the turbofan, including a first mold half having a first front molding part to

form a front face of the rotating plate, a second front molding part disposed outside the first front molding part to form the front face of the shroud, and a third front molding part disposed outside the second front molding part with to form a front face of the outer ring, and a second mold half adapted to be combined with the first mold half, and having a first rear molding part disposed at the center of the second mold half to form a rear face of the rotating plate, a plurality of rear molding parts disposed outside the first rear molding part and having shapes corresponding to the spaces between the blades to form a rear face of the shroud and the plurality of blades, and a third rear molding part disposed outside the second rear molding parts to form a rear face of the outer ring.

The first mold half may include a plurality of inner molding grooves formed outside the first front molding part, which are extended inwardly beyond an internal diameter of the shroud, so as to mold inner ends of the respective blades.

The first mold half may include a plurality of outer molding grooves formed inside the third front molding part, which are extended outwardly beyond an external diameter of the shroud, so as to mold outer ends of respective blades.

This invention will be described in further detail by way of example with reference to the accompanying drawings.

FIGS. 3 and 4 are perspective views showing a turbofan, which is integrally molded by a mold according to the present invention.

As shown in FIGS. 3 and 4, the turbofan 10 according to the present invention includes a circular rotating plate 11 having a central hub 11a integrally formed therewith and to which a rotating shaft of a drive motor (not shown) is coupled, and an outer ring 12 concentrically disposed outside the circular rotating plate 11 with a uniform annular spacing therebetween. The turbofan 10 further includes a plurality of blades 13 which are radially arranged on a peripheral portion of a front face of the circular rotating plate 11

and connected at the rear ends thereof to the circular rotating plate 11 and the outer ring 12, and a ring-shaped shroud 14 integrally formed with the front ends of the blades 13 and spaced apart from the rotating plate 11.

In the subsequent description, a side, where the shroud 14 is positioned is hereinafter referred to as a front side, while a side, where the circular rotating plate 11 is positioned, is hereinafter referred to as a rear side, for the sake of simplicity.

As shown in FIG. 5, the annular spacing 15 defined between the circular rotating plate 11 and the outer ring 12 enables a mold for molding the blades 13 and the shroud 14 to be easily separated from the molded product during a molding operation of the turbofan 10.

Furthermore, for the shake of easy separation of a mold, an external diameter d1 of the circular rotating plate 11 is designed to be equal to or smaller than an internal diameter d2 of the shroud 14, and an internal diameter d3 of the outer ring 12 is designed to be equal to or larger than an external diameter d4 of the shroud 14. In other words, a radial width of the annular spacing 15 is designed to be equal to or larger than a radial width of the shroud 14, so as to allow a mold to be easily separated from the molded product. The rotating plate 11 and the outer ring 12 are integrally molded via the plurality of blades 13, such that the rotating plate 11 and the outer ring 12 are connected to both ends of the rear sides of the blades 13 each having a radial width larger than a radial width of the annular spacing 15.

When the rotating plate 11 is joined to a drive motor (not shown), the center of the rotating plate 11 is protruded forward into a dome shape, so as to enable the turbofan 10 to be stably rotated. As shown FIGS. 3 and 4, the plurality of blades 13 are inclined at a specific angle with respect to the radial directions passing through the corresponding blades. The ring-shaped shroud 14 is upwardly curled at an inner

peripheral portion thereof to have a certain curvature, thereby allowing air introduced into the turbofan 10 to be smoothly and radially discharged.

As shown in FIGS. 5 to 7, a mold for producing the turbofan 10 is comprised of a first mold half 20 and a second mold half 30, which are capable of being combined with each other and separated from each other.

The first mold half 20 is provided at the center thereof with a first front molding part 21 to form a front face of the rotating plate 11, and provided radially outside the first front molding part 21 with a second front molding part 22 having a surface corresponding to a front face of the shroud 14 to form the front concave face of the shroud 14. The first mold half 20 is further provided radially outside the second front molding part 22 with a third front molding part 23 to form a front face of the outer ring 12.

The second mold half 30 is provided at the center thereof with a first rear molding part 31 to form a rear face of the rotating plate 11, and provided radially outside the first rear molding part 31 with a plurality of rear molding parts 32 to form a rear face of the shroud 14 and the plurality of blades 13. As shown in FIG. 7, when the first mold half 20 and the second mold half 30 are combined with each other, the second rear molding parts 32 of the second mold half 30 are moved close to the second front molding part 22 of the first mold half 20 and occupy the respective spaces defined between the blades 13 of the turbofan 10 with a gap corresponding to a thickness of the shroud 14. The plurality of second rear molding parts 32 are designed such that internal and external diameters of the second rear molding parts 32 coincide with internal and external diameters of the second front molding part 22 of the first mold half 20, so as to allow the first and second mold halves 20 and 30 to be easily combined or separated. As shown in FIG. 5, the second mold half 30 is provided radially outside the second rear molding parts with a third rear molding part 33 to form a rear face of the outer ring 12.

The first mold half 20 is further provided outside the first front molding part 21 with a plurality of inner molding grooves 24, which are extended in the combining direction of the first mold half 20 and extended inwardly beyond the internal diameter d2 of the shroud 14, thereby allowing the inner ends 13a of the respective blades 13 to be formed. In addition, the first mold half 20 is provided inside the third front molding part 23 with a plurality of outer molding grooves 25, which are extended in the vertical direction of the first mold half 20 and extended outwardly beyond than the external diameter d4 of the shroud 14, thereby forming the outer ends 13b of the respective blades 13. Accordingly, by the inner and outer molding grooves 24 and 15, the blades 13 are further provided with the inner ends 13a and the outer ends 13b, so that the rotating plate 11 and the outer ring 12 are integrally molded via the blades 13 by the inner ends 13a and the outer ends 13b, which are the extended portions of the blades 13.

In an operation of molding the turbofan 10 by the mold according to the present invention, the first mold half 20 and the second mold half 30 are first combined with each other to define a molding space therebetween, as shown in FIG. 6. After the combination of the first and second mold halves 20 and 30, molten resin is injected into the molding space. The molten resin filled in the molding space gradually solidifies thus forming the turbofan 10.

After the molding of the turbofan 10 is completed, the first and second mold halves 20 and 30 are separated from each other, and thus the molded turbofan 10 is removed from the first and second mold halves 20 and 30. At this point, the second rear molding parts 32 of the second mold half 30 is easily removed from the first mold half 20 through the annular spacing 15 between the rotating plate 11 and the outer ring 12.

[EFFECT OF THE INVENTION]

As apparent from the above description, the present invention provides a

mold, in which even a complex turbofan can be integrally molded by a single molding process, thereby improving the productivity of turbofans, remarkably reducing manufacturing costs and producing turbofans having uniform quality.

In addition, since the mold according to the present invention can mold blades and a shroud of a turbofan by a second rear molding parts of a second mold half, it is possible to integrally mold even a turbofan having complex blades, and to simplify an overall structure of the mold.

[CLAIMS]

[CLAIM 1]

A turbofan comprising:

a rotating plate joined to a shaft of a drive motor;

an outer ring concentrically disposed outside the rotating plate with a spacing therebetween;

a plurality of blades radially arranged on peripheral portion of a front face of the rotating plate and integrally connected at rear ends thereof to the rotating plate and the outer ring; and

a ring-shaped shroud integrally formed with front ends of the blades.

[CLAIM 2]

The turbofan as set forth in claim 1, wherein an external diameter of the rotating plate is equal to or smaller than an internal diameter of the shroud.

[CLAIM 3]

The turbofan as set forth in claim 1, wherein an internal diameter of the outer ring is equal to or larger than an external diameter of the shroud.

[CLAIM 4]

The turbofan as set forth in claim 1, wherein the blades are integrally formed with the rotating plate and the outer ring at both ends of rear sides thereof.

[CLAIM 5]

A mold for manufacturing a turbofan including a rotating plate joined to a shaft of a drive motor, an outer ring concentrically disposed outside the rotating plate with a spacing therebetween, a plurality of blades radially arranged on a peripheral portion of a front face of the rotating plate and integrally connected at rear ends thereof to the rotating plate and the outer ring, and a ring-shaped shroud integrally formed with front ends of the

blades, the mold comprising:

a first mold half including a first front molding part to form a front face of the rotating plate, a second front molding part disposed outside the first front molding part to form the front face of the shroud, and a third front molding part disposed outside the second front molding part with to form a front face of the outer ring; and

a second mold half adapted to be combined with the first mold half, and including a first rear molding part disposed at the center of the second mold half to form a rear face of the rotating plate, a plurality of rear molding parts disposed outside the first rear molding part and having shapes corresponding to the spaces between the blades to form a rear face of the shroud and the plurality of blades, and a third rear molding part disposed outside the second rear molding parts to form a rear face of the outer ring.

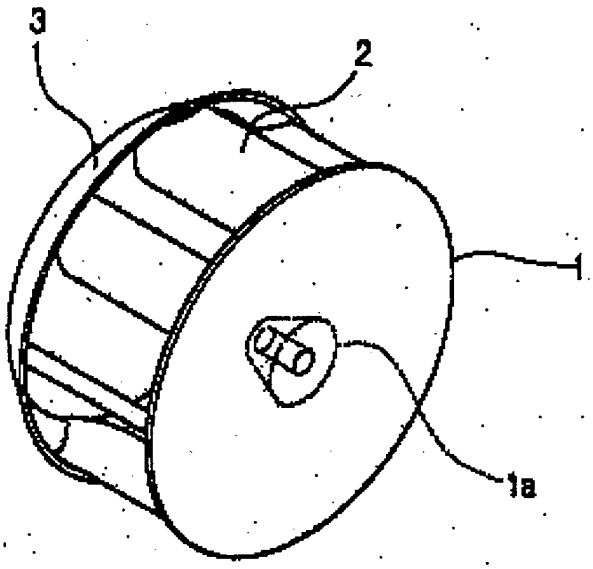
[CLAIM 6]

The mold as set forth in claim 5, wherein the first mold half includes a plurality of inner molding grooves formed outside the first front molding part, which are extended inwardly beyond an internal diameter of the shroud, so as to mold inner ends of the respective blades.

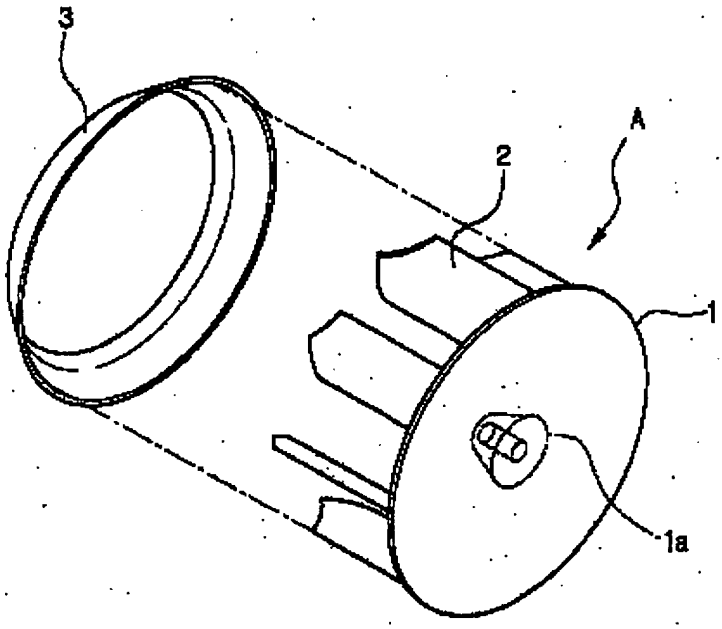
[CLAIM 7]

The mold as set forth in claim 5, wherein the first mold half includes a plurality of outer molding grooves formed inside the third front molding part, which are extended outwardly beyond an external diameter of the shroud, so as to mold outer ends of respective blades.

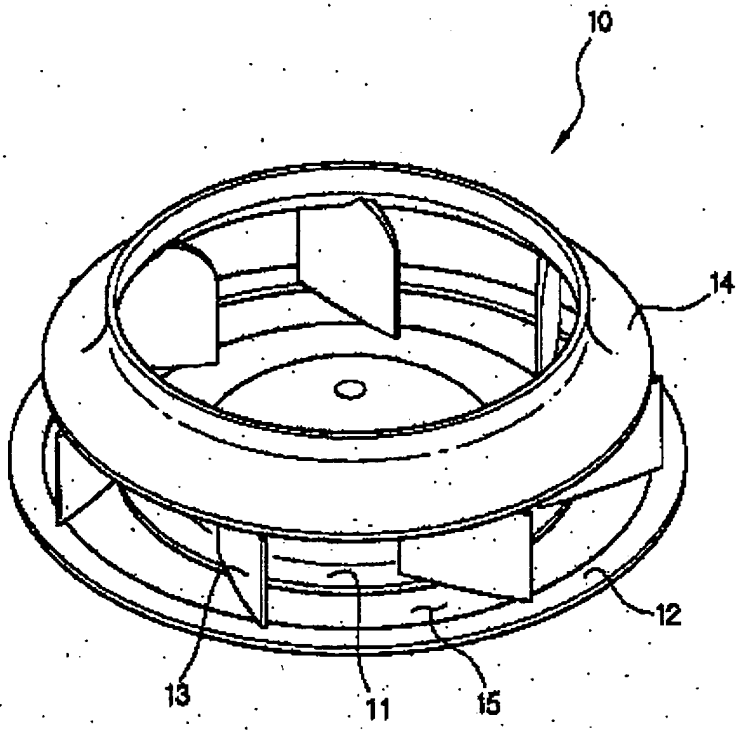
[FIG. 1]



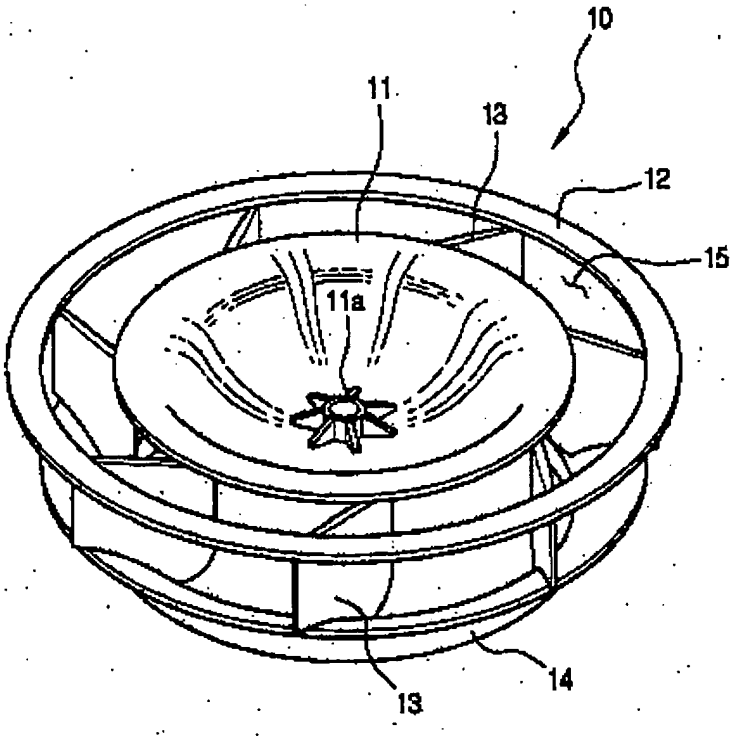
[FIG. 2]



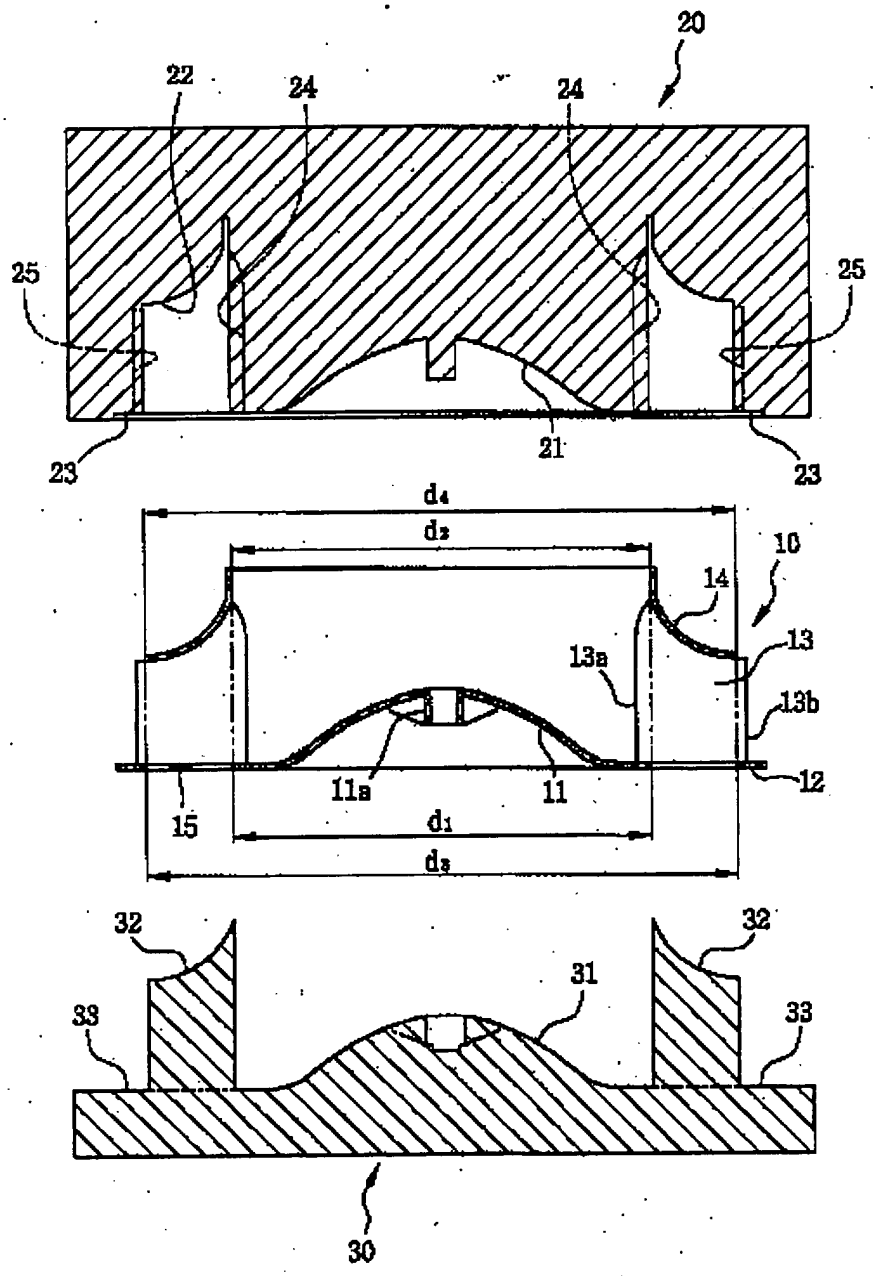
[FIG. 3]



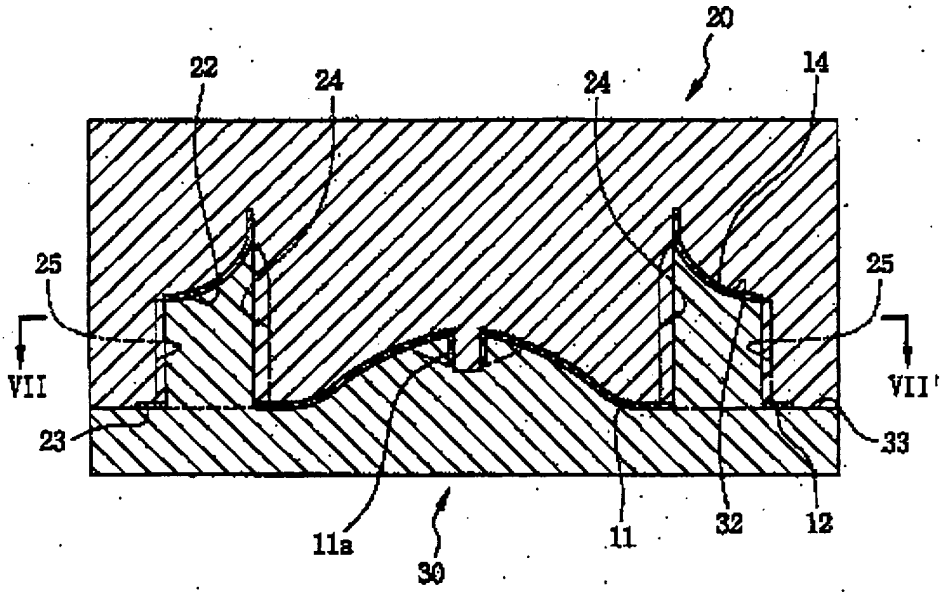
[FIG. 4]



[FIG. 5]


20
22
24
24
25
25
23
21
23
d4
d2
10
14
13
13a
13b
12
11a
11
15
d1
d3
32
32
31
33
33
30

[FIG. 6]



[FIG. 7]